① Ejercicio

$$y = A\sin(Kx - \omega t + \varphi)$$

Sabemos

$$\frac{\partial^2 y}{\partial x^2} = \frac{1}{v^2}\frac{\partial^2 y}{\partial t^2}$$

$$\frac{\partial y}{\partial x} = A\frac{\partial}{\partial x}\sin(Kx - \omega t + \varphi)$$

$$\frac{\partial y}{\partial x} = A\cos(Kx - \omega t + \varphi)\frac{\partial}{\partial x}(Kx - \omega t + \varphi)$$

$$\frac{\partial y}{\partial x} = A\cos(Kx - \omega t + \varphi)(K - 0 + 0)$$

$$\frac{\partial y}{\partial x} = AK\cos(Kx - \omega t + \varphi)$$

$$\frac{\partial^2 y}{\partial x^2} = AK(-\operatorname{sen}(Kx - \omega t + \varphi))(K - 0 + 0)$$

$$\frac{\partial^2 y}{\partial x^2} = -AK^2\operatorname{sen}(Kx - \omega t + \varphi) \quad \ldots \text{ ec } 1$$

$$\frac{\partial y}{\partial t} = \frac{\partial}{\partial t}(A\operatorname{sen}(Kx - \omega t + \varphi))$$

$$\frac{\partial y}{\partial t} = A\cos(Kx - wt + \varphi)(0 - w + 0)$$

$$\frac{\partial y}{\partial t} = -Aw\cos(Kx - wt + \varphi)$$

$$\frac{\partial^2 y}{\partial t^2} = -Aw\left(-\operatorname{sen}(Kx - wt + \varphi)\right)(0 - w + 0)$$

$$\frac{\partial^2 y}{\partial t^2} = -Aw^2 \operatorname{sen}(Kx - wt + \varphi) \quad \ldots \text{ec } 2$$

Remplazando 1 y 2

$$\frac{\partial y^2}{\partial x^2} = \frac{1}{v^2}\frac{\partial^2 y}{\partial t^2}$$

$$\cancel{-A}K^2 \cancel{\operatorname{sen}(Kx - wt + \varphi)} = \frac{1}{v^2}\left(\cancel{-A}w^2 \cancel{\operatorname{sen}(Kx - wt + \varphi)}\right)$$

$$K^2 = \frac{1}{v^2} w^2$$

$$K^2 = \left(\frac{w}{v}\right)^2$$

Sabemos

$$w = 2\pi f$$

$$v = \lambda f$$

$$f = \frac{v}{\lambda}$$

Remplazando

$$\omega = 2\pi \frac{v}{\lambda} = \left(\frac{2\pi}{\lambda}\right) v$$

$$\omega = K v \quad \text{... ec 3}$$

Remplazando

$$K^2 = \left(\frac{\omega}{v}\right)^2$$

$$K^2 = \left(\frac{K \cancel{v}}{\cancel{v}}\right)^2$$

$$K^2 = K^2$$

$$K = K$$

Si es Onda Armonica